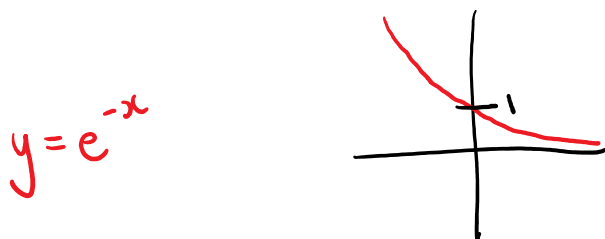
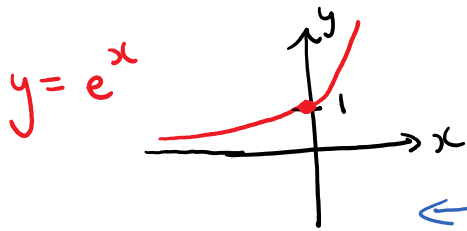


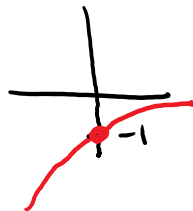
6.3 Exponential Functions Gnt'd

Ex: Graph $y = 2 - e^{-x}$ using transformations



Change sign of x
Hr. Reflection (about y-axis)

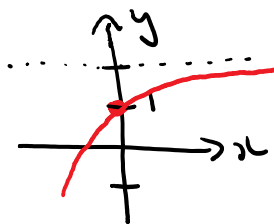
$y = -e^{-x}$



Mult. y by -1 Vertical Reflection (about x-axis)

Add 2 to y Shift Up

$y = 2 - e^{-x}$



Ex: Solve

a) $2^{3x+2} = 16$

Make bases equal

$2^{3x+2} = 2^{\boxed{4}}$

$$3x+2=4$$

$$3x=2$$

$$x = 2/3$$

$$b) \left(\frac{1}{e}\right)^{x^2} = \frac{(e^x)^5}{e^{24}}$$

Make both bases e

$$\boxed{\begin{aligned} (e^{-1})^{x^2} \\ = e^{-x^2} \end{aligned}}$$

$$\boxed{\begin{aligned} e^{5x} \\ \frac{e^{5x}}{e^{24}} \\ = e^{5x-24} \end{aligned}}$$

$$e^{-x^2} = e^{5x-24}$$

$$-x^2 = 5x-24$$

$$0 = x^2 + 5x - 24$$

$$0 = (x+8)(x-3)$$

$$x = -8, 3$$

$$c) 25^{2x+1} = 125^{3x}$$

$$\boxed{\begin{aligned} (5^2)^{2x+1} \\ = 5^{4x+2} \end{aligned}}$$

$$\boxed{\begin{aligned} (5^3)^{3x} \\ = 5^{9x} \end{aligned}}$$

$$\boxed{\begin{aligned} 5^2 &= 25 \\ 5^3 &= 125 \end{aligned}}$$

$$5^{4x+2} = 5^{9x}$$

$$4x+2 = 9x$$

$$2 = 5x$$

$$\frac{2}{5} = x$$

$$x = \frac{2}{5}$$

6.4 Logarithmic Functions

DEF

$\log_a x$ is the exponent that goes on a to make x

Ex: $\log_3 9 = 2$

$$3^{\boxed{2}} = 9$$

$$\log_5 \frac{1}{25} = -2$$

$$5^{\boxed{-2}} = \frac{1}{25}$$

$$\log_4 1 = 0$$

$$4^{\boxed{0}} = 1$$

$$\log_a \sqrt{a} = \frac{1}{2}$$

$$a^{\boxed{\frac{1}{2}}} = \sqrt{a}$$

$$\log_2 2^7 = 7$$

$$2^{\boxed{7}} = 2^7$$

$$\log_b b^{961} = 961$$

$$b^{\boxed{961}} = b^{961}$$

Two Common bases: base e and base 10

NOTATION

$$\ln x = \log_e x$$

← "lawn x"

$$\log x = \log_{10} x$$

Ex: $\ln e^{6.1} = \log_e e^{6.1} = 6.1$

$$\ln 1 = \log_e 1 = 0$$

$$\boxed{0} \quad e^0 = 1$$

$$\ln \sqrt{e} = \log_e \sqrt{e} = \frac{1}{2}$$

$$\boxed{\frac{1}{2}} \quad e^{\frac{1}{2}} = \sqrt{e}$$

$$\log 1000 = \log_{10} 1000 = 3$$

$$\log 0.01 = \log_{10} 0.01 = -2$$

$$\boxed{-2} \quad 10^{-2} = 0.01$$

$$\log 1 = \log_{10} 1 = 0$$

$$\boxed{0} \quad 10^0 = 1$$

DEF

$$\log_2 8 = 3$$

"Logarithmic Equation"

$$2^3 = 8$$

"Exponential Equation"

"Logarithmic Equation"

"Exponential Equation"

Ex: Convert between logarithmic and exponential form

a) $y = 10^x$

The exponent that goes on ~~blah~~¹⁰ to make ~~blah~~^y is ~~blah~~^x

$$\log_{10} y = x \quad \text{or} \quad \log y = x$$

b) $e^x = 6$

$$\log_e 6 = x \quad \text{or} \quad \ln 6 = x$$

c) $\log_3 y = 7$

$$3^7 = y$$

The exponent that goes on 3 to make y is 7.

d) $\ln y = 5 \rightarrow \log_e y = 5$

The exponent that goes on e to make y is 5

$$e^5 = y$$